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## CORRESPONDENCE.

## MR. STEPHENSON'S LETTER ON THE VALUE OF OPTIONS.

*To the Editor.*

SIR,—I venture to think that Mr. Stephenson has not correctly defined the weak point in the Government Annuity Table, commented on by him in the April number of the *Journal*.

The benefits provided for by the table, in return for a single premium to be paid, are\* (1) an assurance for  $n$  years of the amount of the premium, payable should the assured die within that period; and (2), an annuity to be entered on at the expiry of  $n$  years, provided the assured is then alive.

It appears further to be a condition of the transaction, that, in the event of the assured wishing to surrender his policy before entering on his annuity, the surrender value to be allowed him is to be limited to the amount of payment first made. Practically we might assume that the advantage to the Government by such a return is no greater than to form a legitimate profit on a surrender policy; at any rate, in the absence of data as to the proportion of policies thus given up, it is impossible to form any estimate of the probable gain from them.

It follows, therefore, that, for payment of a single premium of £1, the deferred annuity to be granted, allowing for the short assurance, is, by commutation table formula,

$$\frac{D_x - (M_x - M_{x+n})}{N_{x+n}};$$

and that the single premium for an annuity of £1, expressed in terms of Column N, for comparison with Mr. Stephenson's formula for it, is

$$\frac{N_{x+n}}{(1-v)(N_{x-1} - N_{x+n-1}) + D_{x+n}}.$$

After forming a correct estimate of the deferred annuity benefit, Mr. Stephenson proposes to deal with the *payment* as of one where the Government are to be in the receipt of the interest of it only for  $n$  years, receiving the principal at the end of that term should the assured be then alive, and thus providing for the contingency of his death.

The present value of such a payment, where the single premium is nominally £1, is ( $r$  being the interest)

$$\frac{r(N_x - N_{x+n}) + D_{x+n}}{D_x};$$

but this does not truly represent the Government scheme of payment, inasmuch as if the assured die, the repayment to his representatives of £1 being made only at the end of the year of death, a year's interest has accrued thereon, for the disposal of which Mr. Stephenson's formula has not provided, causing the difference between it and the one first above written.

Of course there is no consideration of surrender value enters into the question.

I am, Sir,

Your most obedient servant,

Aberdeen, 5th June, 1865.

H. AMBROSE SMITH.

\* I have not seen the table, but adopt Mr. Stephenson's description of it.